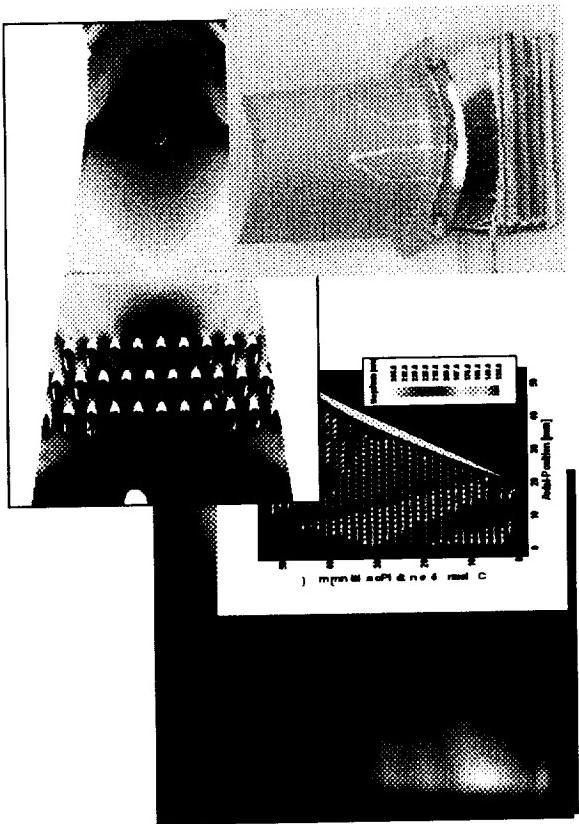


Information Rich Test Instrumentation

Space Transportation Technology Workshop



New project to
Develop ground test
instrumentation for 3rd
Generation Engine tests

Information Rich Test Instrumentation
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Participants in Planning Process

Technical Working Group:

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Kevin Breisacher, Combustion, GRC
Gerry Nissen, Sensors, Boeing
Joel McManus, Sensors, Boeing
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Bob Truesdale, Solid Rockets, AEDC

Proposals by:

Mike Marcolini, Instrumentation, LaRC
Glenn Diskin, Hypersonics, LaRC
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Jih-Fen Lei, Instrumentation, GRC

W.T. Powers, Avionics, MSFC
Ravi Mehta, Instrumentation, ARC

Gregory A. Hall, Space Transportation, KSC
Don Gardner, Instrumentation, AEDC
William Mouyos, Sensors, Lockheed Sanders
Bill St. Cyr, SSC

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GOALS

- Increase safety by understanding operating conditions and component capabilities
- Reduce development and operating costs by:
 - Reducing testing and design cycle times and
 - Reducing engine weight and increasing component life

OBJECTIVES

- Determine cooling system effectiveness
- Determine structural loads

TECHNICAL CHALLENGES

- 2000 deg F surfaces; 8000 deg F flows; up to Mach 11
- Remote signal extraction
- Ultra-low intrusive measurements

Technologies targeted
and selected to address objectives

Technologies

	Cooling System	Surface Temp	Surface Heat Flux	Gas Temp	Combustion	Weight	Surface strain	CFD validation	Velocity	Temperature	Objectives
Velocimetry											
Spectroscopy											
Phosphor Paints	○	○	○	○	○	○	○	○	○	○	
Thin Films/MEMS	○	○	○	○	○	○	○	○	○	○	

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Tasks awarded for FY01:

- Micro-fabricated multifunctional smart sensor system for harsh environments (*surface heat flux, temperature, strain, vibration*) GRC
- High temperature surface measurements using thermographic phosphors
(*surface temperature, heat flux*) GRC + Oak Ridge National Labs
- Flow temperature profiling using smart particles imaging technology
(*gas temperature*) LaRC + GRC
- Embedded, integrated, high frequency response, multi-plane velocimetric system for aeropropulsion systems (*gas velocity*) LaRC + GRC

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Milestones/Activities

- ◆ Surface point techniques:
 - **FY01** **Feasibility test of inorganic binders at 1000C**
 - **FY02** **Multi-functional thin film sensor array demo**
- ◆ Planar optical techniques:
 - **FY03** **Temperature sensing “smart” particle demo at 1000C**
 - **FY04** **Multiplexed fiber optic velocimetry demo**
- ◆ Prioritized list of Activities
 - **Develop and demonstrate surface heat flux measurements**
 - **Develop and demonstrate surface temperature measurements**
 - **Develop and demonstrate gas velocity measurements**

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